U. S. Department of the Interior
Bureau of Land Management

Alaska State Office
222 West 7th, #13
Anchorage, Alaska 99513

Ground Brood Counts to Estimate Waterfowl Populations in BLM's Kobuk District, Alaska: 1991 Progress Report

R. J. Brown and R. R. Jandt

BLM-Alaska Open File Report 43
December 1992

Authors

R. R. Jandt is a wildlife biologist with the Kobuk District, Fairbanks, Alaska.

R. J. Brown is a biotechnician with the Kobuk District, Fairbanks, Alaska.

Open File Reports

Open File Reports identify the results of inventories or other investigations that are made available to the public outside the formal BLM-Alaska technical publication series. These reports can include preliminary or incomplete data and are not published and distributed in quantity. The reports are available at BLM offices in Alaska, the USDI Resources Library in Anchorage, various libraries of the University of Alaska, and other selected locations.

Copies are also available for inspection at the USDI Natural Resources Library in Washington, D.C., and at the BLM Service Center Library in Denver.

Ground Brood Counts to Estimate Waterfowl Populations in on the Seward Peninsula, Alaska. 1991 Progress Report.

R. J. Brown and R. R. Jandt

Bureau of Land Management
Alaska State Office
Anchorage, Alaska 99513

Open File Report 43
December 1992

Table of Contents

List of Figures

List of Tables

Abstract

Abstract: Between July 23 and July 30, 1991, the Kobuk District of the Bureau of Land Management (BLM) conducted waterfowl brood surveys in two production areas on the Seward Peninsula in Alaska. McCarthys Marsh, in the Fish River flats, was surveyed for the third consecutive year. Wetlands along the upper Kuzitrin River, from near Bunker Hill in the southwest to Lava Lake in the northeast, were surveyed for the first time. A stratified random sampling technique was used to select the plots to be surveyed. Thirty 2.6-km^2 plots were surveyed, 14 in McCarthys Marsh and 16 in the Kuzitrin basin. The estimated production in McCarthys Marsh was 5485 ± 1700 young ducks, or 13.70 young/km^2. The estimated production in the Kuzitrin River wetlands was 6615 ± 1786 young ducks, or 13.98 young/km^2.

GROUND BROOD COUNTS TO ESTIMATE WATERFOWL PRODUCTION ON THE SEWARD PENINSULA, ALASKA, 1991 PROGRESS REPORT

R. J. Brown and R. R. Jandt

BACKGROUND

Migratory waterfowl pay no attention to local, regional or national boundaries, but cover the entire continent during their annual migrations. They are considered to be "our birds" by the people in the north, the south, and by all the people in between. As global travel and communications have become easier and faster, and humans are able to look beyond their immediate surroundings, both physical and temporal, it has become increasingly obvious that people must view waterfowl from a continental (or even global) perspective or risk depleting the resource to a level that may threaten its existence. Thus, studies on the Alaskan breeding grounds of migratory waterfowl take on national and international significance. At the regional level, information on waterfowl habitat quantity, quality, relative productivity and utilization is essential to establish informed management policy relating to wetlands on public lands.

In 1974 the U.S. Fish and Wildlife Service (USFWS) started duck production surveys in the Yukon Flats and in the upper Tanana River valley near Tetlin. In 1982 they began to develop a systematic approach to brood surveys on other production areas within the state (USFWS 1991).

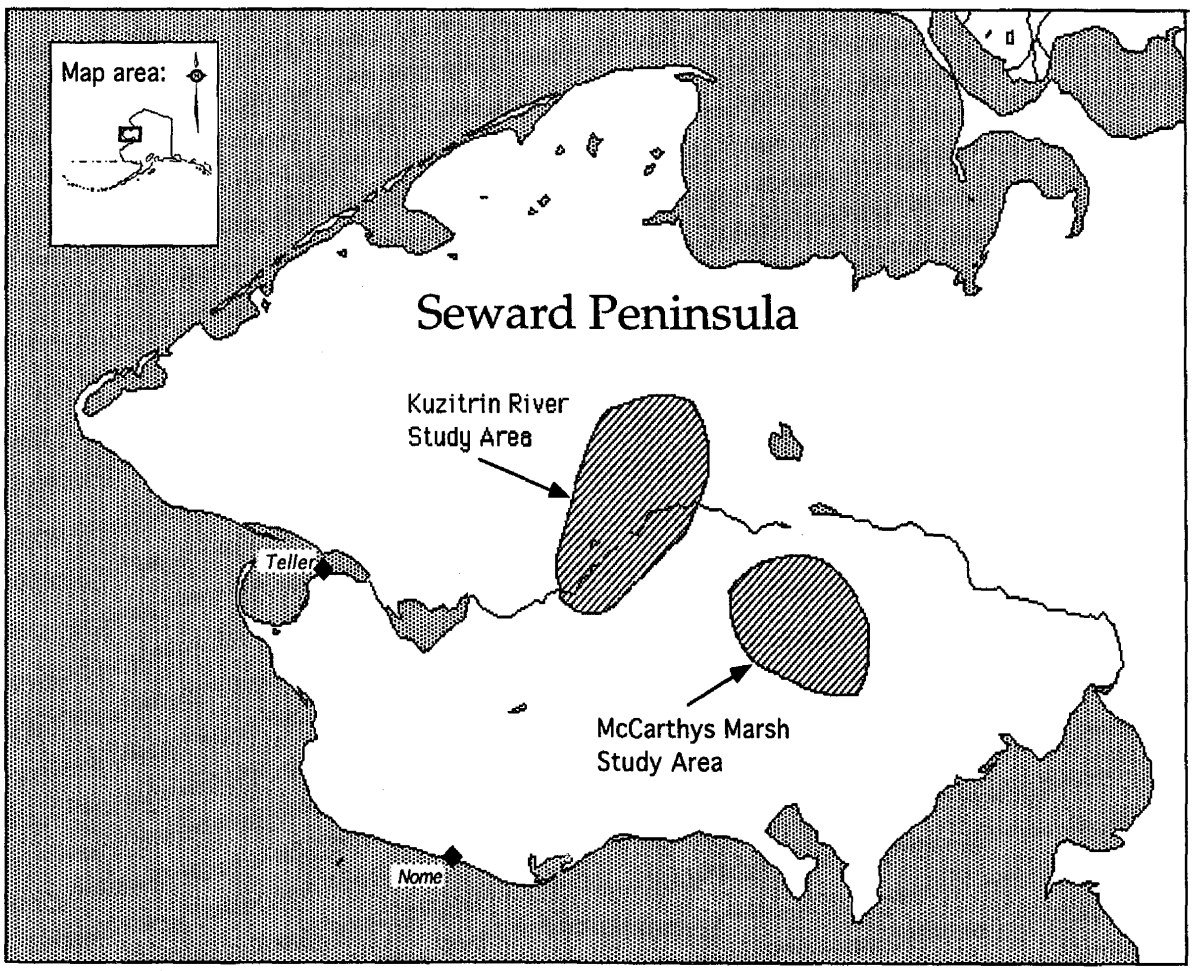


Figure 1. Study area locations.

Now most of their inventory effort is directed to refuges. Some large wetland areas in Alaska are on land managed by the Kobuk District of the Bureau of Land Management. Starting in 1989, the Kobuk District joined in the effort to quantify waterfowl production and to inventory breeding habitat in Alaska. In 1989 and 1990, BLM conducted waterfowl brood surveys in McCarthys Marsh on the Seward Peninsula. BLM also cooperated with the USFWS in a brood survey in the Pah River Flats in 1989 and 1990 (Anderson and Robinson 1991(a), 1991(b)). In 1991, BLM conducted the third annual waterfowl inventory in McCarthys Marsh and with the cooperation of the National Park Service-Bering Land Bridge National Preserve, inventoried the wetlands along the upper Kuzitrin River.

The authors acknowledge several people who helped with field observations, including H. Brownell, W. Gregg, H. Hankins, N. Messenger, L. Whalon, C. Altop and C. Wilson of BLM; volunteers B. Dame and H. McGuire; and M. Philippart and T. Silbaugh from the National Park Service. Safe air transportation to and from the plots surveyed was provided by K. Sweetsir (Wright's Air) and A. Sabaka (Kenai Air Alaska).

STUDY AREA

McCarthys Marsh is located in the Fish River valley on the southern Seward Peninsula and is 520 km^2 in size (Fig. 1). The Bendeleben Mountains border the river flats to the north, and the Darby Mountains surround them on the east and southeast. Numerous streams flow into the flats from the surrounding mountains. The Fish River drains the wetlands, flowing south to Golovnin Bay off Norton Sound. McCarthys Marsh ranges in elevation from 15-90 m. Death Valley was also included in the McCarthys Marsh survey area, adding 182 km^2 of waterfowl habitat to the survey. Death Valley, east of the Darby Mountains, is drained by the Tubutulik River and its elevation averages 160 m.

The Kuzitrin River survey area is 835 km^2 and lies in the westcentral part of the Seward Peninsula (Fig. 1). The Kuzitrin, Noxapaga and Kougarok Rivers flow into the wetlands from the east and the north. The area is drained by the Kuzitrin River, which flows west to Imuruk Basin. The elevation of the Kuzitrin River survey area ranges from 15-90 m. Approximately 30 percent of the wetlands in the northeastern section of the survey area lie within the Bering Land Bridge National Preserve. The boundaries of this survey area were based on waterfowl production areas defined by the USFWS, Office of Migratory Bird Management.

The two survey areas mentioned are similar in many ways. White spruce (*Picea glauca*), black spruce (*Picea mariana*) and balsam poplar (*Populus balsamifera*), as well as willows (*Salix spp.*) and alders (*Alnus crispa*) >2 m in height, are confined to the riparian zones. Elsewhere, treeless tundra prevails with patches of various shrub communities, including dwarf birch (*Betula nana*), willows and alders, growing in hollows and sheltered depressions.

With the exceptions of oxbow lakes, or lakes near enough to a river to be within the riparian zone and subject to riparian influences, most of the lakes in both areas are of thermokarst origin. Some lakes have very little emergent or submergent plant life while others have emergent vegetation all around the margins, submergent vegetation throughout shallow areas, and some contain plankton suspended in the water. The most common types of emergent and submergent vegetation observed were buckbean (*Menyanthes trifoliata*), marsh fivefinger (*Potentilla palustris*), marsh marigold (*Caltha palustris*), yellow pond lily (*Nuphar polysepalum*), various sedges (*Carex*), water hemlock (*Cicuta mackenzieana*), bur reed (*Sparganium*), horsetail (*Equisetum*), bladderwort (*Utricularia vulgaris*), duckweed (*Lemna trisulca*) and pondweed (*Potamogeton*). Also present were rusty saxifrage (*Saxifraga hieracifolia*), thoroughwax (*Bupleurum triradiatum*) and labrador tea (*Ledum*

palustre). Cloudberries (*Rubus chamaemorus*) (locally referred to as salmonberries), and blueberries (*Vaccinium uliginosum*) were abundant in both areas.

In the northeastern part of the Kuzitrin wetlands are extensive lava fields covering >200 km^2. Many of the lakes, as well as the Kuzitrin and Noxapaga Rivers carry water from the lava fields. It is not known how the ecology of the wetlands is affected by the drainage from the lava fields.

METHODS

The survey design was modeled on stratification criteria used by the USFWS Koyukuk-Nowitna Refuge staff (Rost and Bertram 1989). Survey areas were divided into 2.6 km^2 plots defined by section lines on U.S. Geological Survey (USGS) 1:63,360 scale topographic maps. Each plot was then stratified based on water surface area and estimated flow of water based on streams that appeared on the maps. A pond with no stream flowing into or out of it was considered to be a bog pond. Lakes that extended beyond the boundaries of individual sections were included in the section that contained the majority of the lake's surface area. Water surface area was determined using a dot grid counter.

Individual sections were classed as being "no habitat" (<6 ha of water in ponds or lakes), "poor habitat" (6-24 ha, or >24 ha of pond surface if all water bodies were bog ponds, and no individual water body exceeded 24 ha), and "other habitat" (≥24 ha of pond surface with some flow, or if an individual water body was >24 ha). Rivers and streams that appeared to maintain a steady flow rather than seasonal flow were not counted as water surface area. Sample plots from the "poor" and "other" habitat were then randomly selected for survey. The sections classed as "no habitat, " while perhaps containing some broods, were not considered for survey since their overall contribution to the production of the wetlands was presumed to be minimal. The highest density of sample units was taken from the "other" stratum to reduce the variance of the stratified mean broods/plot (McDonald et al. 1989).

In 1991, 14 plots in McCarthys Marsh and 16 plots in the Kuzitrin River valley were surveyed. Access to the plots was by floatplane or helicopter. When the floatplane landed on a pond in a plot to be surveyed, that pond was surveyed last if possible, or if not, the survey party waited for at least 30 minutes after the plane departed before beginning the survey. Adult ducks, swans, and geese sometimes departed lakes as the aircraft approached, but the broods did not show great disturbance and appeared to resume normal activities within 30 minutes of the floatplane landing. Survey teams used binoculars and spotting scopes to observe waterfowl while walking or canoeing the margins of all ponds in sample plots. Priority was given to identifying, quantifying and aging broods, but all waterfowl were recorded. On some large lakes and complex series of lakes, two people worked together with two canoes.

Common plants were recorded for one water body in each plot. On selected lakes, water temperature was measured, depth and transparency estimated using a Secchi disk, and water hardness and pH determined using a Hach water chemistry kit.

After returning to Fairbanks, the raw data was keyed into the Alaska Duck Production Survey Data Analysis Software computer program, developed by Jack Hodges and Dennis Witmer of the USFWS (1990). Data from the survey was available to the USFWS, Migratory Birds Management for computing statewide production estimates and the fall flight forecast.

In the results and the discussion sections that follow, diving ducks (tribe: *Aythini*) and sea ducks (tribe: *Mergini*) are both referred to as divers. Expanded estimates for young ducks include the average historical brood size derived from USFWS five-

year averages (Hodges and Witmer 1990) for each broody hen and partial brood observed. The coefficient of variation for expanded young ducks was figured for the observed young only. Gang broods were broken into historical average brood sizes for each species.

RESULTS

Waterfowl Production and Species Composition

McCarthys Marsh had approximately 400 km^2 of waterfowl habitat, with 150 km^2 in the "other" stratum and 250 km^2 in the "poor" stratum. Fourteen 2.6 km^2 plots were surveyed, nine "other" and five "poor" plots. Ten people participated in the actual observational work in the marsh, taking a total of four days to survey the 14 plots. They saw 330 adult ducks and 659 young in 172 broods, 3 white-fronted geese (*Anser albifrons*) with 2 young, 26 Canada geese (*Branta canadensis*) with 34 young, 14 adult tundra swans (*Cygnus columbianus*) with 3 young, 36 red-necked grebes (*Podiceps grisegena*) with 17 young, 2 horned grebes (*P. auritus*) with 2 young, 19 pacific loons (*Gavia pacifica*) with 1 young, and 5 sandhill cranes (*Grus canadensis*).

Mallards (*Anas platyrhynchos*), American wigeons (*A. americana*), green-winged teals (*A. crecca*), northern shovelers (*A. clypeata*), and northern pintails (*A. acuta*) were the dabbling ducks seen in McCarthys Marsh. Divers included a redhead (*Aythya americana*), greater scaups (*A. marila*), a common goldeneye (*Bucephala clangula*), a bufflehead (*B. albeola*), oldsquaws (*Clangula hyemalis*), black scoters (*Melanitta nigra*) and surf scoters (*M. perspicillata*).

Pintail and wigeon broods together comprised almost 50 percent of the broods observed in McCarthys Marsh and Death Valley (Table 1, Fig. 2). Dabbler production exceeded diver production by a factor of 1.6, based on the number of young observed. The average brood size (considering only observed broods of known size) for pintails was 4.0 ± 1.8 (n=30), and for wigeons it was 4.7 ± 2.4 (n=35).

The expanded estimate of duck broods in McCarthys Marsh was 1205 ± 362 broods, a CV (coefficient of variation) of 30 percent. This is equivalent to an average of 3.01 broods/km^2. The estimated production of

Table 1. Numbers and percentages of broods, young, and adult ducks observed in McCarthys Marsh, Alaska 1991.

Species	Broods		Young		Adults	
Mallard	11	6%	24	4%	23	7%
Wigeon	38	22%	166	25%	42	13%
Green-winged Teal	18	10%	46	7%	38	12%
Shoveler	7	4%	26	4%	12	4%
Pintail	46	27%	144	22%	98	30%
Redhead	0	0%	0	0%	1	0%
Greater Scaup	17	10%	101	15%	29	9%
Common Goldeneye	1	1%	2	0%	1	0%
Bufflehead	0	0%	0	0%	1	0%
Oldsquaw	15	9%	59	9%	25	8%
Black Scoter	6	3%	32	5%	34	10%
Surf Scoter	6	3%	21	3%	8	2%
Unidentified Ducks	7	4%	38	6%	18	5%
Total	172	100%	659	100%	330	100%

young ducks in McCarthys Marsh was 5485 ± 1700, a CV of 31 percent. This is equivalent to an average of 13.70 young ducks/ km^2. "Other" habitat contributed 88 percent of the overall production.

Pintails were the predominant species of adult dabbling ducks seen in McCarthys Marsh (Table 1). They accounted for almost 30 percent of the adult ducks observed. Wigeons, green-winged teals, black scoters and scaups were the next most common ducks, accounting for about 43 percent of the adult ducks seen (Table 1). Data from the past three years in McCarthys Marsh shows large variation in numbers of adult ducks (Fig. 3).

The Kuzitrin River production area was estimated to contain 475 km^2 of waterfowl habitat, with 130 km^2 in the "other" stratum and 345 km^2 in the "poor" stratum. Sixteen 2.6 km^2 plots were surveyed, 10 "other" and 6 "poor" plots. Nine people participated in the actual observational work in the wetlands, taking four days to survey the 16 plots. They saw 815 adult ducks with 780 young in 186 broods, 16 white-fronted geese with 17 young, 131 Canada geese with 25 young, 28 tundra swans with 21 young, 30 red-necked grebes with 10 young, 3 common loons (*Gavia immer*), 9 yellow-billed loons (*G. adamsii*), 33 pacific loons with 1 young, and 4 sandhill cranes.

Mallards, American wigeons, green-winged teals, northern shovelers and northern pintails were the dabbling ducks seen in the Kuzitrin wetlands. Greater scaups, common goldeneyes, a bufflehead, oldsquaws, a spectacled eider (*Somateria fischeri*), black scoters, white-winged scoters (*Melanitta fusca*), surf scoters, common mergansers (*Mergus merganser*) and red-breasted mergansers (*M. serrator*) were the diving ducks seen.

Wigeons and pintails were the most common adult ducks seen in the Kuzitrin. Scaup were slightly less common than either wigeons or pintails, but had more broods and produced more young than any

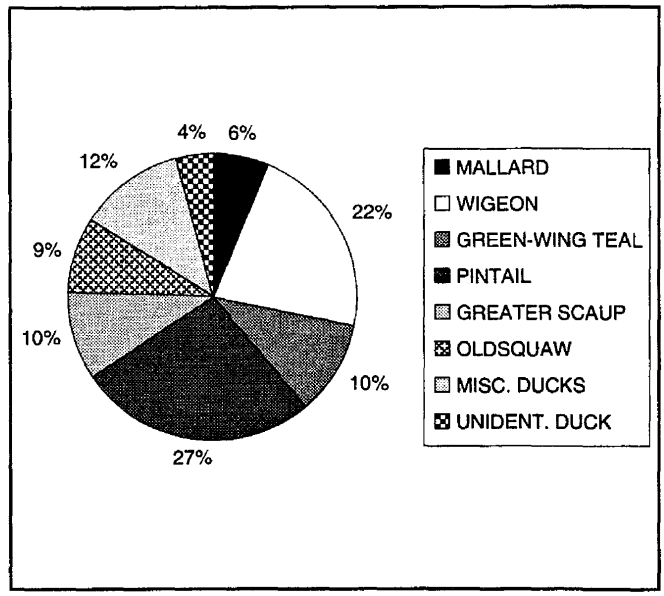


Figure 2. Species composition of duck broods in McCarthys Marsh, Alaska, 1991.

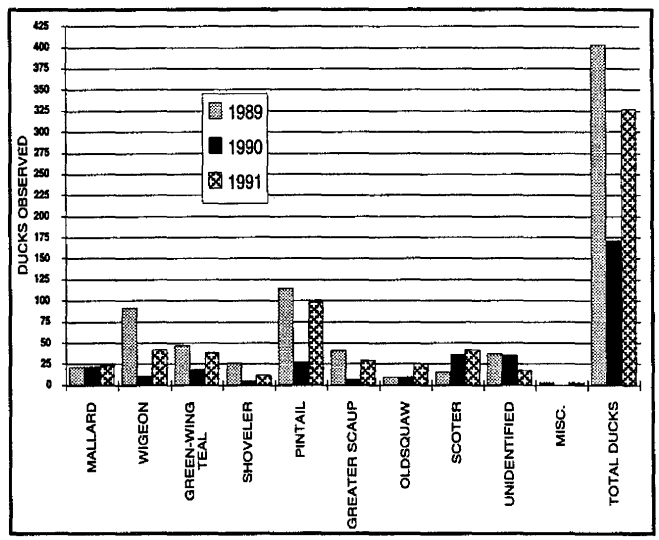


Figure 3. Number of adult ducks observed from 1989-1991 in McCarthys Marsh, Alaska.

other duck in the wetlands (Table 2, Fig. 4). Diver production exceeded dabbler production by a factor of 1.5, based on the number of young observed (Table 2). The average brood size for pintails was 3.3 ± 2.9 (n=27), for wigeons it was 4.0 ± 2.3 (n=16) and for scaups it was 4.6 ± 2.2 (n=38).

The expanded estimate of duck broods in the Kuzitrin wetlands was 1570 ± 345 broods, a CV of 22 percent. This is equivalent to an average of 3.32 broods/km^2. The

Table 2. Numbers and percentages of broods, young, and adult ducks observed in Kuzitrin River wetlands, Alaska 1991.

Species	Broods		Young		Adults	
Mallard	3	2%	12	2%	35	4%
Wigeon	30	16%	120	15%	197	24%
Green-winged Teal	15	8%	42	5%	84	10%
Shoveler	10	5%	44	6%	31	4%
Pintail	36	19%	92	12%	176	22%
Greater Scaup	46	25%	224	29%	160	20%
Common Goldeneye	1	1%	2	0%	8	1%
Bufflehead	1	1%	4	1%	1	0%
Oldsquaw	13	7%	71	9%	44	5%
Black Scoter	17	9%	95	12%	51	6%
Surf Scoter	4	2%	22	3%	13	2%
White-winged Scoter	2	1%	11	1%	4	0%
Miscellaneous	1	1%	6	1%	8	1%
Unidentified Ducks	7	4%	35	4%	3	0%
Total	186	100%	780	100%	815	100%

estimated production of young ducks in the Kuzitrin wetlands was 6615 ± 1786, a CV of 27 percent. This is equivalent to an average of 13.98 young ducks/km^2. "Other" habitat contributed 52 percent of the overall production.

Limnologic Variables

Tests for pH, hardness and temperature were done in three lakes in McCarthys Marsh in 1990, and in seven lakes within the Kuzitrin study area in 1991. The pH values ranged from slightly acidic at 6.5 to basic at 8.3. Hardness varied considerably with values from 1-27 mg/l $CaCO_3$. The temperature ranged from 12-17 ° C (Table 3).

DISCUSSION

The formula used by the LOTUS™ program to compute variance assumes a small sample size compared to the population size. In this case, the sampling fraction correction factor $(N_i-n_i)/N_i$ approaches unity[1] and is commonly dropped from the formula, as in this LOTUS™ program. When the sample size is large compared to the stratum size, the correction factor can be

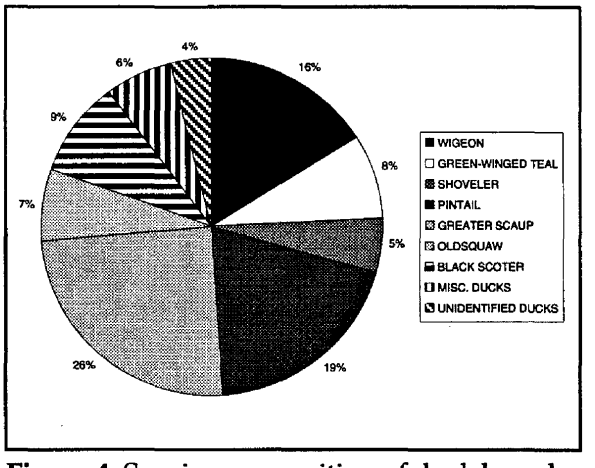


Figure 4. Species composition of duck broods in the Kuzitrin wetlands, Alaska, 1991.

used to avoid overestimating variance. Thus, for the Kuzitrin study area, although the reported CV for broods was 22.0 percent, use of the correction factor yielded a CV of 16.0 percent. This result was only slightly over the target CV of 15 percent. The "other" stratum accounted for in this stratum was 10/50 or 20 percent. Applied to the McCarthys Marsh data, the same technique reduces the CV for broods from 30.0 percent to 27.7 percent. In this case the sampling fraction was 15.5 percent of the

[1] The full formula for the variance of the stratified mean broods is:

$$\mathrm{var}(\bar{y}_{ST}) = \frac{1}{N^2} \sum_{i=1}^{L} N_i^2 \left(\frac{N_i - n_i}{N_i}\right)\left(\frac{s_i^2}{n_i}\right)$$

Table 3. Water pH, hardness, temperture values from selected water bodies in the Kuzitrin and McCarthys Marsh, Alaska study areas.

Year	Plot/Pond	pH	Hardness*	Temp (°C)
1991	146/1	8.3	18	12
1991	110/1	7.8	27	13
1991	107/5	7	12	14
1991	15/2	7.7	12	13
1991	26/4	6.7	10	13
1991	106/1	6.7	12	12
1991	90/1	6.8	6	13
1990	0-7/1	6.9	3	17
1990	0-3/4	6.5	2	15
1990	0-2/1	6.8	1	17

*units are in mg $CaCO_3/1$

"other" stratum, which contributed 90 percent of the variance. The allocation of samples should be adjusted in this production area for a more efficient survey. The sample allocation formula of Scheaffer et al. (1990: 111), suggests a sample size of 3 "poor" plots and 11 "other" plots, assuming the total plots sampled remains 14. The formula:

$$n_i = n\,(N_i\sigma_i) / (\Sigma\, N_i\sigma_i)$$

assumes an equal cost of sampling for each type of plot, which is reasonable considering that "poor" plots frequently require helicopter access, but "other" plots require considerably more time to survey.

Results of the past three years from McCarthys Marsh show a steady increase in the average number of broods per plot (Fig. 5). The average number of duck broods/ km^2 in 1989 was 1.40; in 1990 it was 1.69 (Anderson et al. 1991) and in 1991 it was 3.01. At the 95 percent confidence level there was no significant increase in numbers of broods between 1989 and 1990, but there was a significant increase between 1990 and 1991 ($t = 2.12$, $p = 0.03$). The average number of young ducks/km^2 showed a similar increase, from 5.2 in 1989, 8.3 in 1990 and 13.7 in 1991.

There was a difference in the ratio of dabbler to diver broods and young in the two study areas (Fig. 6). The Kuzitrin wetlands contained an average of 1.63 dabbler broods/km^2 and 1.61 diver broods/km^2, nearly a 1:1 ratio, while McCarthys Marsh contained 2.09 dabbler broods/km^2 and 0.80 diver broods/km^2, a 2.6:1 ratio. The Kuzitrin wetlands contained an average of 5.86 young dabbler ducks/km^2 and 7.63 young diver ducks/km^2, a 1:1.3 ratio, while McCarthys Marsh contained 8.82 young dabbler ducks/km^2 and 4.23 young diver ducks/km^2, a 2.1:1 ratio. This difference will be examined further in coming years in an attempt to relate observations to habitat characteristics.

Dabbler and diver brood frequencies were examined in relation to pH, water hardness and temperature measurements on certain lakes. Pearson's correlations were calculated using Minitab (Minitab 7.2, Minitab, Inc.) for dabbler, diver and total broods with the limnologic variables: pH, water hardness, and water surface temperature. The number of diver broods was strongly correlated with the pH of ponds in the Kuzitrin River study area ($n = 7$, $r = 0.911$). Dabbler broods did not show a correlation with any of the three variables. Total broods were also correlated with pH ($n = 7$, $r = 0.805$).

However, Spearman's *rho* (rank correlation) between total broods showed a stronger correlation with hardness (n = 7, r = 0.846) than with pH (r = 0.654). If measurement accuracy could be improved and/or if pH and water hardness could be measured with comparable accuracy, the inconsistency between parametric and nonparametric results may be eliminated. When three observations from 1990 were added, the correlation between diver broods in a pond and its pH remained very high (n = 10, r = 0.911).

Regressions of total broods, dabbler broods and diver broods were run of pH, water hardness and water surface temperature. The only good fit which resulted was obtained by regressing diver broods against pH and hardness (n = 7, R^2 = 0.838, p = 0.03). When additional data from 1990 was added, the regression equation remained very similar, with pH and hardness explaining 84 percent of the variation in diver brood numbers. The equation was:

Diver broods = -49.4 + 7.28 pH + 0.030 hardness (n = 10, R^2 = 0.831, F = 17.18, p = 0.002)

This finding seems quite significant, in spite of the small sample size. It appears that pH and water hardness warrant further study as predictors of diver brood density.

Fire plays a major part in the revitalization of many ecosystems in Alaska. It can release nutrients for reuse, and uncover mineral soils by burning off existing ground cover, resulting in greater thaw depth and new growth. The treeless tundra of the Seward Peninsula burns from time to time when lightning strikes after a period of dry weather. However, regrowth patterns and other effects fire may have on this ecosystem are not well understood. Some of the plots surveyed in the Kuzitrin basin were burned in 1971. A preliminary comparison of duck broods on "other" stratum burned plots (n = 4) to "other" stratum unburned plots (n = 6) was made to assess whether fires might be influencing duck production

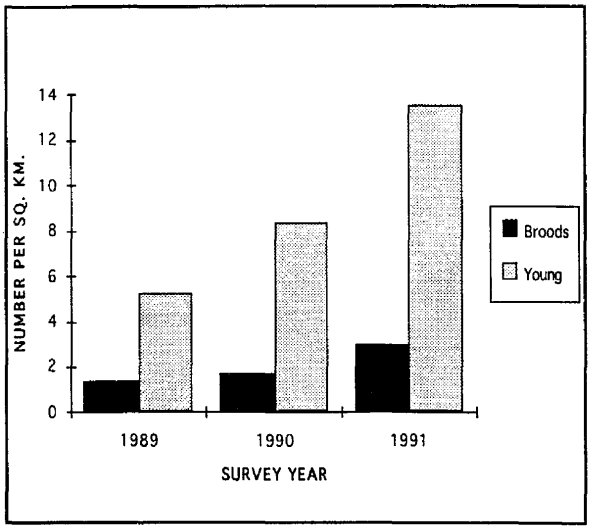


Figure 5. Number of duck broods and young ducks/km^2 in McCarthys Marsh, Alaska, for 1989, 90 and 91.

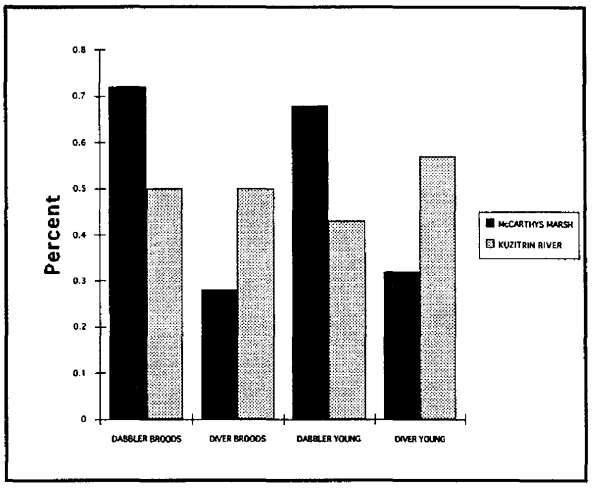


Figure 6. Percentage of dabbler and diver broods and young in McCarthy Marsh and Kuzitrin River wetlands, Alaska, 1991.

in this wetland ecosystem. The average number of broods on burned plots was 6.25 while on the unburned plots it was 21.83. This difference was not quite significant at the 95 percent confidence level (t = 1.64, P = 0.07). Many factors are involved in the productivity of tundra wetlands and no conclusions can be drawn from this small sample, but certainly the effects of fire on waterfowl production in subarctic ecosystems require further study.

The time of nesting and the success of nesting efforts is determined by a variety of factors including weather at the nesting site

as well as along the migration path, water levels, food availability and predators. Thus, there is some variation in the average time of nesting each year. Dabbling ducks tend to initiate nesting earlier in the spring than diving ducks. If a brood survey were conducted too early, many of the diver broods that were not yet hatched would be missed, while if the survey were done too late, many of the dabbler broods would be fully fledged and flying already, making them difficult or impossible to distinguish from adult birds.

We attempted to time the survey to the combined peak of brood rearing, so that the majority of dabbler broods should be seen as Class II (partly fledged) and III (mostly fledged), and the majority of diver broods should be Class I (downy) and II. The timing of the Kuzitrin survey appears ideal, as Class III dabbler broods > Class I, and Class I diver broods > Class III (Fig. 7).

Survey timing was more difficult to evaluate in McCarthys Marsh, but the survey was probably well timed. Class II dabbler and diver broods > either Class I or Class III broods, however Class III dabbler broods > than Class I dabbler broods, and Class I diver broods > Class III diver broods (Fig. 8). Perhaps a late storm delayed dabblers, or caused some early nests to fail, or maybe the mountains that surround McCarthys Marsh delay spring thaw and thus open water necessary for feeding and nesting, relative to the Kuzitrin valley.

It is probably not appropriate to use the information gathered regarding geese or swans to estimate population numbers or production estimates. Even though they were counted when seen, the geese and swans showed no hesitation in leaving ponds and running across the tundra to other ponds when they were approached. The quantity of evidence of their presence, combined with the relatively small numbers seen, suggests that only a small percentage of the total number of swans and geese in the area was seen. An aerial survey would be more effective for swans and possibly more effective for geese. Swans, and perhaps other waterfowl, were eating cloudberries and blueberries near some of the ponds that were surveyed. Buckbean leaves were being utilized for food on several ponds. In many places, the emergent grasses and sedges had been grazed upon extensively. It appeared that geese rested on banks where extensive patches of horsetails grew.

Although only two young loons and one loon nest with two eggs were seen, a total of 64 adult loons were observed in the two survey areas in 1991. Loons nest on the Seward Peninsula from late May to about mid-June (Kessel 1989). Incubation takes from 23 to 30 days (depending on the species) and young loons take about two months to fledge (Ehrlich et al. 1988). Broods that had not yet hatched at the time of the survey might fail to fledge before freeze-up. The young may have been hiding successfully or possibly loon production was low compared to the number of adults observed. A low ratio of young to adult loons has been recorded in each of the three brood surveys conducted in McCarthys Marsh, with an observed total of 40 adult pacific loons with five young, and nine adult common loons.

Other wildlife observations incidental to the survey warrant brief discussion. Several beavers (*Castor canadensis*), as well as lodges, dams and cuttings, were seen in McCarthys Marsh. The level of activity seemed substantially increased from previous survey years. However, no beaver sign was seen in the Kuzitrin River drainage. It seems that up until about 40 years ago beavers were uncommon or absent on the Seward Peninsula (Melchior per. comm.). Some areas, such as McCarthys Marsh, seem to have healthy populations of beavers, and they may be extending their range farther into the Seward Peninsula, and increasing their densities in the areas they now inhabit.

Like beavers, moose (*Alces alces*) were unknown or very rarely seen by modern

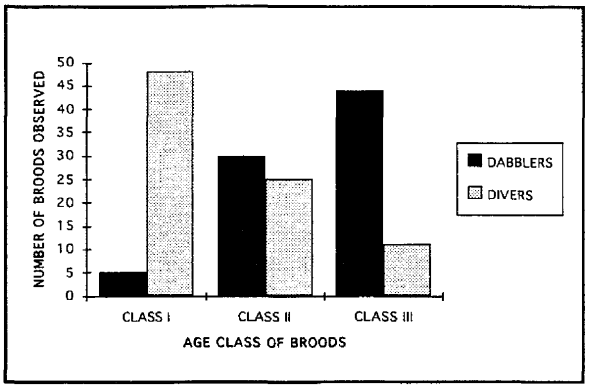


Figure 7. Number of broods in the three major age classes for dabblers and divers in the Kuzitrin River study area, Alaska, 1991.

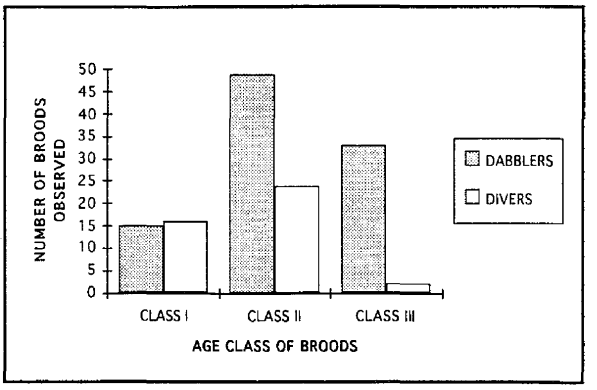


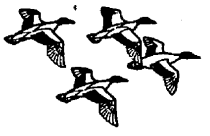
Figure 8. Number of broods in the three major age classes for dabbler and divers in McCarthys Marsh, Alaska, 1991.

people on the Seward Peninsula until 40 or 50 years ago (Grauvogel 1984), when moose began to populate the area. Since then, they have extended their range to include the entire Seward Peninsula. Moose sign was evident in both study areas, with the highest concentration observed on two survey plots on the upper Noxapaga River, where many of the willow patches in the area showed signs of extensive browsing.

Across the entire Kuzitrin River wetlands area, rusty tussock moth (*Orgyia antiqua*) caterpillars were observed. In some areas the caterpillars were so numerous that they had completely defoliated all the shrub willows. Near one pond the caterpillars had moved to the emergent grass after the willow leaves in the area were gone. The extent of the caterpillar infestation is not known for certain, nor whether wintering moose will suffer any ill effects as a result of the caterpillars. Conversely, if any of the waterfowl utilized the caterpillars as a food source, they would have had an abundant, rich food supply for their young at an important time, possibly increasing survival rates. No heavy infestation of caterpillars or noticeable ill effects on the willows were seen in McCarthys Marsh.

A musk ox (*Ovibos moschatus*) was seen in McCarthys Marsh. Observers were close enough to notice several porcupine quills in the left side of the musk ox's face. Several porcupines (*Erethizon dorsatum*) were seen by BLM employees in the mountains near McCarthys Marsh and near Nome in the summer of 1991. Other animals observed include grizzly bears (*Ursus arctos*), muskrats (*Ondatra zibethicus)* and river otters (*Lutra canadensis*).

Assessing habitat quality is a primary consideration for BLM, as the agency must make decisions regarding development and use proposals. Habitat quality can be derived in part from an assessment of habitat use. Baseline information about the habitat and its use will allow BLM to monitor the ecosystem for possible changes brought about by development, livestock grazing, road construction or global warming. In addition, the information obtained from waterfowl brood inventories across the state allows game management agencies to estimate numbers of waterfowl in the annual fall migration and to set bag limits accordingly. The inventories also provide information about the distribution and abundance of waterfowl, making it possible to detect increases, decreases and movements of breeding populations.



Literature Cited

Anderson, R. and S. Robinson. 1991a. Ground brood counts to estimate waterfowl populations on two habitats in western Alaska. The Wildlife Society: Proc. of the Western and Northwestern Sections Meeting in Reno, NV, Feb. 22-24, 1990.

——. 1991b. Ground brood counts to estimate waterfowl populations in BLM's Kobuk District, Alaska. 1990 progress report. United States Department of the Interior, Bureau of Land Management, Fairbanks, AK. Open File Report 32. 10pp.

Ehrlich, R. R., D. S. Dobkin, and D. Wheye. (1988). The Birder's Handbook. Simon and Schuster Inc., New York, NY. 785pp.

Grauvogel, C. A. 1984. Seward Peninsula moose population identity study. Alaska Department of Fish and Game, Juneau, AK. 93pp.

Hodges, J. and D. Witmer. 1990. Alaska duck production survey data analysis software. Produced in association with USDI, FWS, Migratory Bird Management, Juneau, AK.

Kessel, B. 1989. Birds of the Seward Peninsula, Alaska. University of Alaska Press. pp 61-68.

McDonald, L. L., H. B. Harvey, and T. J. Novotny. 1989. Recommendations for refinement of duck brood surveys for the Alaska region of the U.S. Fish and Wildlife Service. Depts. of Statistics and Zoology, Univ. of Wyoming, Laramie. 25pp.

Rost, G., and M. Bertram. 1989. Koyukuk National Wildlife Refuge 1988 duck brood survey (draft). USDI, Fish and Wld. Service, Koyukuk NWR, Galena, AK. 13pp

Scheaffer, R. L., W. Mendenhall, and L. Ott. 1990. Elementary Survey Sampling, fourth edition. PWS-Kent Publishing Company, Boston, Mass. 390pp.

USFWS. (1991). Draft duck production survey standard operating procedures manual (unpublished document), Anchorage, AK. 34pp.

Sources for Scientific Nomenclature

Bellrose, F. C. 1980. Ducks, geese and swans of North America, 3rd edition. Stackpole Books, Harrisburg, PA. 540pp.

Covell, C. V. Jr. 1984. A field guide to the moths of eastern North America, a Peterson field guide series. Houghton Mifflin Company, Boston, Mass. 496pp.

Hall, E. R., and K. R. Kelson. 1959. The mammals of North America, Vols. 1 and 2. The Ronald Press Company, New York. 1083pp.

Hultén, E. 1968. Flora of Alaska and neighboring territories. Stanford University Press, Stanford, CA. 1008pp.

Walker, E. P., et al. 1964. Mammals of the world, vols. 1 and 2. John Hopkins Press, Baltimore, MD. 1500pp.

The Bureau of Land Management is responsible for the stewardship of our public lands. It is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people for all times. Management is based on the principles of multiple use and sustained yield of our nation's resources within a framework of environmental responsibility and scientific technology. These resources include recreation, range, timber, minerals, watershed, fish and wildlife, wilderness, air, scenic, scientific and cultural values.

BLM-AK-PT-93-012-6700-070